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ELECTROSTATIC TYPE TEST ELECTRODE

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This invention relates generally to electrostatic type electrodes for applying high frequency electrostatic fields to substances in various types of operations. Such electrodes are used, for instance, in test or control apparatus, as apparatus sensitive to such a property of materials as moisture content.

For an understanding of certain typical uses to which electrodes of the type of which the present invention is concerned may be applied, reference may be directed to our copending application entitled Apparatus and method for electrically testing materials, Ser. No. 15,633, filed April 10, 1935, now Patent No. 2,123,812, and our later copending application entitled Power absorption metering system, Ser. No. 125,110, filed February 10, 1937. A typical though not an exclusive use of such equipment is the measurement of, or response in accordance with, percentage of moisture content in a given material. The method consists in subjecting the material in question to the influence of the electrostatic field of a test electrode unit, thereby causing a change in the electrical state of the electrical system which energizes the electrodes, which change may for instance be read on an indicating instrument, or utilized to effect a control operation, etc. In accordance with our preferred test and control equipment, disclosed in the aforesaid application, Ser. No. 125,110, the system operates or reads in terms of the power absorbed from the electrostatic field of the electrodes by the material placed in said field. It may be stated, however, that while the electrodes may be operated in conjunction with test or control equipment on a power absorption principle, no limitation on the scope of the present invention is to be implied therein, since the electrostatic electrodes of the present invention are adapted for use in various other types of tests and/or control systems, or in such applications as heating, etc.

The electrode unit is of a type comprising two co-planar electrodes of the condenser plate or electrostatic field type. The physical advantage in placement of both electrodes in one common plane (which per se is not new) resides in the fact that the electrostatic field between a pair of electrodes so arranged extends beyond the face of the electrode unit, and may be caused to penetrate the surface of a wall or given sample of material by simply applying the electrode unit to the face of the wall or material in question. This permits applying a field to a material, as for example to a concrete wall, in situations in

which placement of test electrodes on opposite sides of the material might be impossible.

Among the objects of the present invention are:

To provide an electrostatic type electrode unit characterized by uniformity of field concentration over a given area, and also uniformity of depth of penetration of the material by the field applied thereto;

To provide an electrode unit having a uniform field of relatively small effective depth, such that the field will not project through and beyond thin materials as paper pulp or veneers when the unit is applied thereagainst, the advantage in such a condition being that the thickness of the material does not affect the reading of a connected indicating instrument provided that the effective field depth is less than the thickness of the material on test;

To provide an electrostatic type electrode capable of being designed to have various degrees of field concentration with relation to effective depth of field;

To provide a test electrode unit for such uses as moisture registration which tends to give a reading of average moisture content rather than a peak reading when applied to a material in which the property under test is non-uniform or "spotty";

To provide a test electrode unit of such characteristics that the effect of surface irregularities of a material under test is minimized;

To provide means at the electrostatic test electrodes for controlling the response characteristic of test apparatus such as moisture register apparatus; and

To provide an electrostatic electrode device adapted for measurement of, or response in accordance with, relative humidity.

The electrode unit provided by the present invention is comprised, in general, of relatively long and narrow co-planar plate elements of relatively narrow uniform spacing, and usually of small thickness dimension. Usually and preferably, though not in all instances, each electrode is formed with a plurality of branching plate elements, the branches of one electrode interfitting at uniform spacing with the branches of the opposite electrode, so that the electrode unit covers over a given area of the material to which the electrostatic field is to be applied.

We have discovered that the effective penetration of a material by the electrostatic field of a pair of coplanar electrode plates or elements of uniform widths and spacings, as provided by